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JPRS Report

Telecommunications

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JPRS-TTP-88-007 *25 MAY 1988*

CONTENTS

AFRICA (SUB-SAHARA)

MOZAMBIQUE

Microwave Link Established With Malawi; Project Described
[Roziliro Twea; Blantyre DAILY TIMES, 11 Mar 88] 1

CANADA

Nortel Signs Digital PBX Joint Venture Agreement With China
[James Rusk; Toronto THE GLOBE AND MAIL, 15 Apr 88] 2
B. C. Tel Starts Laying Fiber Optic Line *[Vancouver THE SUN, 23 Mar 88]* 2
Business Reported Booming at Two Cellular Networks
[Windsor THE SATURDAY WINDSOR STAR, 12 Mar 88] 3

CHINA

FRG To Use Chinese Satellite for Research *[Beijing XINHUA Domestic Service, 7 May 88]* 4
Accelerated Satellite Launchings To Aid Economy *[Beijing XINHUA Domestic Service, 12 May 88]* 4
Hainan Speeds Up Telecommunications Development
[Beijing ZHONGGUO XINWEN SHE, 8 May 88] 4

EAST ASIA

HONG KONG

Changes in Telecommunications Law Reviewed
[Lulu Yu; Hong Kong SOUTH CHINA MORNING POST, 5 Apr 88] 6

JAPAN

Telecommunications Minister To Visit UK, France *[Tokyo KYODO, 21 Apr 88]* 7

LATIN AMERICA

JAMAICA

$62 Million Investment in Telecommunications Planned
[Kingston THE DAILY GLEANER, 11 Apr 88] 8

NEAR EAST & SOUTH ASIA

BANGLADESH

Indigenous Phone Sets, Exchanges in Production *[Dhaka THE NEW NATION, 15 Mar 88]* 9

INDIA

Building of Satellite Center Discussed With USSR *[Madras THE HINDU, 28 Mar 88]* 9
Remote Sensing Satellite Transmitting Regularly
[Delhi Doordarshan Television Network, 4 May 88] 10
ADB Loan for Telecommunications *[Delhi Domestic Service, 27 Apr 88]* 10

IRAN

TV Transmitter in Lorestan *[Tehran Domestic Service, 27 Apr 88]* 10

WEST EUROPE

BELGIUM

Belgium's ACEC in ESPRIT Fiber Optics Project
[Brussels NOUVELLES DE LA SCIENCE ET DES TECHNOLOGIES, Oct 87] 11

FEDERAL REPUBLIC OF GERMANY

Cabinet Plans Restructuring of Bundespost Services
[Frankfurt/Main FRANKFURTER ALLGEMEINE, 13 May 88] 14
TV-SAT 2 To Be Launched *[Hamburg DPA, 11 May 88]* 14

ITALY

ESA Plans for Land Mobile Satellite Systems Outlined
[Alex Steciw; Milan ALTA FREQUENZA, No 10, Dec 87] 14
Evolution of European Cellular Communications Reviewed
[Renzo Failli, Pietro Porzio Giusto; Milan ALTA FREQUENZA, Dec 87] 17
Telettra Applications of Microwave Technologies Outlined
[Guido Vannucchi; Milan ALTA FREQUENZA, Dec 87] 19
Selenia Spazio Researcher on New Satellite Communications
[Claudio Mastracci; Milan ALTA FREQUENZA, Dec 87] 23

NORWAY

Three of Largest Businesses in Mobile Phone Project
[Ulf Peter Hellstrom; Oslo AFTENPOSTEN, 9 Apr 88] 27

MOZAMBIQUE

Microwave Link Established With Malawi; Project Described

55000007 Blantyre DAILY TIMES in English
11 Mar 88 p 15

[Article by Roziliro Twea]

[Text] Malawi and Mozambique are soon to strike a higher wavelength in communication with the establishment of the Salambidwe Microwave Station in Chikwawa.

Situated in the outskirts of Chief Chapananga's area, some 70 kilometres north-west of the Boma, the new microwave station stands about 950 metres above sea level, at the southern tip of the Kirk Range on the Malawi/Mozambique border.

Work on the project started after the governments of Malawi, Mozambique and Zimbabwe signed a K18.30 million aid agreement with the governments of Norway and Sweden "for the delivery and installation of telecommunications equipment and associated works on microwave contacts between the three southern African states".

Signing

The signing ceremony took place during Sadcc's annual consultative conference in Gaberone, Botswana's capital in February of last year.

Salambidwe Station is thus expected to provide a direct relay link between Blantyre and Tete in Mozambique, from where further booster units would connect the former to Harare in Zimbabwe and Beira on the Mozambican coast.

When the job is finally completed, before the end of the year according to the contractors, E B Nera and Company—Mozambique and Malawi will "literally enjoy better telecommunication, on a higher wavelength."

The first phase of the project has already been completed at a cost of K2.2 million, boasting a 21 kilometre all weather road and a hilltop station.

The road links the station and the outlying areas to Mwanza and Chikwawa and places further in country through a seasonal District Road Improvement and Maintenance Project (Drimp) thorough-fare which runs on the fringes of Majete game reserve, joining the two border districts.

During a recent visit to the site, the Post Master General and a group of senior government engineers, consulting engineering, donors' and contractors' representatives noted that farm areas are opening up and settlers are moving in along the road.

The second phase of the project is to commence soon and will entail equipping the hilltop station with relay equipment and provision of powers, besides the installation of a 55 metre radio tower to carry three large antennas dishes.

Already, in front of the repeater building on the 200 square metres top area of the Salambidwe peak some four square slabs can be seen marking the base of the tower.

According to the contractors, the station will be solar powered, even though a buffer diesel tank has been installed "in case of a ten days period of no sunshine" said Mr. Hugh Kiggel of E B Nera.

"The project will greatly facilitate communication, not in the three countries, but also the entire Sadcc region and other parts of the world", observed the Post Master General as he conversed with the Norwegian consul, Mr. Andreas Christiani.

/9738

Nortel Signs Digital PBX Joint Venture Agreement With China

55200031 Toronto THE GLOBE AND MAIL in English 15 Apr 88 p B18

[Article by James Rusk]

[Text] Northern Telecom Ltd. has signed a joint-venture agreement that will make it the first supplier of digital private branch exchanges in China.

"We don't think we were the first ones in the revolving door, but we're the first out," David Vice, company president, said in an interview. Negotiating a deal in China is sometimes a process that takes years, but the Mississauga-based company wrapped up its joint-venture agreement in 14 months.

Northern Telecom will own 55 percent of the $13-million (U.S.) joint venture, which will be located in Shenzen, a special economic zone adjacent to Hong Kong.

The lead partner on the Chinese side is Tong Guang Electronic Corp. The other two partners are Shekou District Economic Development Co. and Factory 834 of Jiangxi province.

The signing gives Northern Telecom a leg up in the Chinese market. It is the first of a number of joint ventures that China plans between Western suppliers and 10 key companies, one of them Tong Guang, in the domestic telecommunications industry.

While the planned venture is fairly modest for a manufacturing giant the size of Northern Telecom, Mr. Vice suggested that the company is thinking bigger.

"This is the initial capital for today's view of what we're going to do here—I wouldn't want to put a limit on the investment because I wouldn't want to put a limit on the amount of business we're going to do here."

China, which has made telecommunications one of its investment priorities, is one of the most rapidly growing markets in the world. At present, there are but six telephone lines for every 1,000 inhabitants and the country wants to increase that to 30 lines by the end of the century.

The joint-venture factory will be set up in rented quarters, but a new building is expected to be built in the second year of operation. Initial production is expected in six months.

The Chinese market for private branch exchanges is growing much more rapidly than the market for public exchanges, mainly because large Chinese units often find it easier to get the financing to renovate their internal telephone systems than do Chinese telephone companies.

The factory will have annual capacity to produce PBXs with a total of 100,000 lines, but that could easily be expanded to 200,000 to 300,000 lines, Mr. Vice said. At present, the Chinese market is about one million lines a year.

Northern Telecom has been a leading supplier of PBXs to China. Mr. Vice said that, among others, the Foreign Ministry and the Ministry of Electronics Industry, several large hotels and the now-building Beijing World Trade Centre have purchased the company's Meridian SL-1 for their internal telephone systems.

Sales will be given a further boost as the system is made in China and domestic customers will be able to pay for it with a mixture of hard foreign exchange and soft local currency, Mr. Vice said. As the proportion of Chinese value added rises over time, Chinese customers will have to use even less foreign exchange.

/9738

B. C. Tel Starts Laying Fiber Optic Line

55200032 Vancouver THE SUN in English 23 Mar 88 p E1

[Text] B.C. Tel has just begun work on what it says is its largest capital project ever: A $104-million lightguide cable system running from the Alberta border to downtown Vancouver.

The cable incorporates the latest advances in fibre optics development and laser technology, said project director Brian Canfield, a company executive vice-president.

"We will be able to provide virtually noise-free transmission and greater capacity for audio, video and data communications."

The cable contains 12 glass fibres with one pair of hair-thin strands able to transmit the information contained in 32 volumes of the encyclopedia Britannica in less than a second.

A total of 76 kilometres of cable will be laid in some of B.C.'s most rugged terrain in the two-year project, which completes Telecom Canada's coast-to-coast lightguide transmission system.

B.C. Tel spokesman Maureen Kirkbride said Tuesday the cable will augment B.C. Tel's two high capacity microwave systems to become the company's third Canada-wide communications link.

Customers of the microwave systems include Teleglobe, the Royal Bank of Canada, the Bank of Montreal, Woodward's and Pemberton Securities, she said.

The cable will be able to carry 10 times as much data as the two microwave systems combined and will eventually be able to carry 100 times as much, she said.

Cost of using the system when it comes on-line in 1990 should be comparable to existing technology and will be reduced over time, she said.

Kirkbride said that construction, involving 250 workers, began a few weeks ago near Jasper, Alta. From there, the cable goes to Valemount, Clearwater, Kamloops, Merritt, Hope and Vancouver.

Most of the cable will be buried adjacent to existing utility corridors such as hydro, pipeline or highway routes.

/9738

Business Reported Booming at Two Cellular Networks

55200033 Windsor THE SATURDAY WINDSOR STAR in English 12 Mar 88 p F9

[Text] Toronto—Just three years after getting the green light from federal regulators, business is booming at Canada's two cellular telephone networks—CellNet Canada and Cantel Inc.

Their subscriber base is growing at twice the forecast rate, current operations have moved into the black, profitable services are catching fire, and, to judge by a service cancellation rate of less than one percent, customers are happy.

CellNet, which is a national affiliation of telephone company cellular units, had its upbeat annual meeting in Toronto this week.

Cantel, a national network 65-percent owned by Toronto-based Rogers Communications Inc., is its main rival.

But the price is so princely and the rewards so immediate that neither has had to draw marketing blood.

Less than three years after the Canadian Radio-Television and Telecommunications Commission approved cellular telephone service the industry's value—in terms of hardware and connect services—has leapt to more than $400 million.

The two companies have a total of some 120,000 subscribers and will likely reach close to 200,000 by the end of 1988, officials say.

By 1990, the two competitors expect to have 400,000 subscribers—a number worth more than $1.5-billion in phones and services.

The long-term potential is between 1.5 million and two million phones, said Kathy McLaughlin, assistant vice-president of marketing at Cantel.

By the end of this year, much of the industry's $500-million capital investment will have been covered and profits should begin in 1989, she added.

With those numbers and the even distribution—Cantel claims 65,000 subscribers, CellNet 600,000—competition is bound to be less like a business brawl and more like a marketing soft shoe.

Spending on promotional campaigns is up by about 25 percent for both this year, but the themes are still generic in nature—aimed at preaching to the unconverted.

For example, Cantel was able to move a batch of phones last year by setting up a system for a Toronto real estate company that enabled the company's salesmen to plug into the computerized real estate listings service from their cars.

The companies are neck-and-neck in developing the mobile office—a carry-around black box outfitted to provide phone, computer, facsimile, dictation, telephone answering, paging, electronic mail and a host of value-added connect services in a car, on a boat or in a backyard.

/9738

FRG To Use Chinese Satellite for Research

OW1005211288 Beijing XINHUA Domestic Service in Chinese 0600 GMT 7 May 88

[Text] Bonn, 6 May (XINHUA)—In July this year, West Germany will use China's retrievable satellite to conduct two research projects under the weightless condition in space, the West German Ministry for Research and Technology announced today.

China will launch a satellite via a "Long March-2" rocket. The experiment module on the satellite will carry two sets of West German equipment, one for monitoring and recording the external conditions during the flight, and the other for conducting experiments in the growth of protein crystals.

West German Minister for Research and Technology Riesenhuber stressed that cooperation in science and technology has thus far been very successful between West Germany and China, especially the cooperation given by West German enterprises in building China's DFH-3 radio and television satellite and the cooperation between the West German Aviation and Space Research and Experiment Bureau and the China Astronautic Technology Research Institute. A joint symposium on micro-gravity, he said, is scheduled to be held in Bonn next December, the 10th anniversary of cooperation in science and technology between the two sides.

Accelerated Satellite Launchings To Aid Economy

OW1305032188 Beijing XINHUA Domestic Service in Chinese 1211 GMT 12 May 88

[By correspondent Ren Weidong and reporter Zhou Zhongmin]

[Text] Beijing, 12 May (XINHUA)—China intends to launch several urgently needed and operational satellites in the near future for economic development purposes, a leading official of the Ministry of Aeronautics and Astronautics told XINHUA reporters at the fourth membership meeting of the Society of Aeronautics held today.

Based on the pressing need for the development of the national economy and construction, satellites for meteorological use, telecommunications, resources surveying, and marine undertakings will be listed as major tasks for China's satellite research and launch endeavors. It is reported that in the next few years, China will launch a weather satellite first, followed by a number of communications satellites. A more updated communications satellite with a large capacity will also be developed.

Since 1970, China has sent up a total of 21 satellites. Right now, China can produce and launch 8 to 10 satellites (with an average of 1 to 2 satellites actually launched each year). It has accumulated Many valuable experiences.

It is reported that China has also attained gratifying results in making use of satellites to carry out scientific research. In August and September 1987, China launched two retrievable satellites with remote sensing ability to carry out experiments in material processing. With the torch-shaped gallium arsenide monocrystal obtained from the experiments, it has greatly improved the purity of monocrystals. In the field of biology, crop seeds, vegetables, flowers, medicinal plants and trees which went through testing in space showed different effects and results in germination percentage, growth rate, and genetic changes after they were planted on earth. Radish seeds which went through tests in space also showed strong resistance against insect pests after were planted on earth.

The official of the Ministry of Aeronautics and Astronautics pointed out: From now on, China will not only accelerate the research and launching of urgently needed and operational satellites for economic development purposes, but also actively expand cooperation with foreign countries and compete with other countries on the international market. While developing the "Long March-3" carrier rocket, it will step up the development of more advanced carrier rockets in order to further enhance its launching capability. In addition, research and preparations are being made to set up a space station and send Chinese astronauts into space.

Hainan Speeds Up Telecommunications Development

HK1105015588 Beijing ZHONGGUO XINWEN SHE in Chinese 0857 GMT 8 May 88

[Text] Haikou, 8 May (ZHONGGUO XINWEN SHE)—Hainan will have 12,000 new automatic telephones this year. Long-distance communication lines are also heading for perfection. As a result, the difficulties in making telephone calls in Hainan will be minimized.

Ji Taizhi, deputy director of Hainan Post and Telecommunications Bureau, said that since the preparations made to establish Hainan Province, businessmen and tourists at home and abroad have come to Hainan one after another, leading to a strain in telecommunications. To meet the pressing need, Haikou imported a 2,000-programmed telephone project from Canada which is expected to be connected in June this year; the 5,000-programmed telephone project imported from Japan last year which is now under construction is expected to be connected by the end of 1988; and the 3,000-programmed telephone project imported by Sanya from Hong Kong can be put into operation in June this year. Consequently, Haikou, and Sanya will have 10,000 new automatic telephones this year, greatly easing the strain in telecommunications.

Ji added that construction of Hainan's long-distance communication lines is proceeding rapidly. The Haikou-Guangzhou 1,800-microwave communication line

project and the Haikou-Sanya 960-microwave communication line project have been completed and put into operation. Now Haikou, Sanya, and Tongshen can dial direct to Guangzhou, Beijing, and Hong Kong. In addition, the 300-coaxial underground cable running through the center of Hainan has also been connected. The cable which links with the mainland cable from northern Sanya and through Haikou is 320 km in length. The connection has made it convenient for the Li and Miao nationalities in the Wuzhishan hinterland to maintain contacts with the outside.

Of the 19 cities and counties in Hainan, 13 have automatic telephones. The three counties including Dongfang, Tunchang, and Baisha will have automatic telephones installed this year. The whole island will be connected with automatic telephones in the next year or the year after.

It has been reported that Hainan will invest 200 million yuan in post and telecommunications construction in the next 3 years. Apart from the 25,000- and 10,000-programmed telephone projects respectively in Haikou and Sanya, an optical fiber cable project will be built in the east to connect Qiongshan, Wenchang, Qionghai, Wanning, and other Overseas Chinese hometowns.

Ji Taizhi said that Hainan is seeking cooperation with foreign businessmen in developing post and telecommunications. So far the United States, FRG, France, Japan, Sweden, and Canada have sent delegations to Hainan to conduct a survey of post and telecommunications undertakings. Hainan plans to invite tenders from abroad to build the east optical fiber cable project and the 35,000-programmed telephone project in Haikou and Sanya.

HONG KONG

Changes in Telecommunications Law Reviewed

55400045 Hong Kong SOUTH CHINA MORNING POST in English 5 Apr 88 pp 1, 2

[Article by Lulu Yu]

[Text] Most Hongkong people will have the chance to view satellite programs of their choice when a new law on telecommunications is passed later this year.

The Government is considering changes to the outdated Telecommunications Ordinance which will enable tenants of multi-storey blocks to share private satellite dishes, without infringing the franchise of the Cable and Wireless Company.

At present, anyone can set up a satellite dish in a backyard or on a rooftop for private use, but it is illegal for tenants of a multi-storey building to share a dish.

While a few residents already own dishes to pick up overseas programs, the Government banned hotels from setting up services last year because they were considered a commercial activity.

It is against the law to collect satellite signals for commercial distribution.

Cable and Wireless is the sole provider of external telecommunications facilities, including satellite services, telex, telephone and telegrams until 2006.

But the existing law also empowers the governor-in-Council to vary or amend the terms of Cable and Wireless' licence to give others rights to receive and distribute telecommunications services to particular users.

The Government has been reluctant to use that power, particularly in the case of hotels, because of the complexities involved in overseeing a commercial operation where hotel customers could be charged for the satellite services.

Such a departure from existing legal provisions is also considered too drastic and too controversial.

Instead, the Government now suggests that companies wishing to provide hotels with satellite services be granted temporary licences to beam programs into hotel rooms via Cable and Wireless' microwave links.

It will also ask the Executive Council to consider allowing residents to have their own communal satellite dishes for the reception of signals, subject to the approval of the Postmaster-General.

Those who own communal dishes will still be barred from selling their satellite services for a profit.

A policy paper outlining the proposals will be submitted to the Executive Council for approval by June and legislative changes are expected before the end of the year.

The Government's review of its telecommunications policy began more than three years ago but was set aside in favour of more urgent deliberations on cable television.

At least one company, the United States-based Cable News Network, has applied to have its 24-hour news service broadcast in hotels before cable television comes on stream. The application by Mr. Ted Turner's network has implications for both Hongkong's broadcasting policy and for cable television.

A Secretariat official told the SOUTH CHINA MORNING POST that any licence granted would only be temporary until the satellite services could be relayed on cable TV.

The question of satellite reception by private households also has wide implications for the Cable and Wireless franchise.

The Post Office, the Administrative Services and Information Branch and the Economic Services Branch have come up with a recommendation to allow satellite signals to be received in single apartment blocks, with the building management or selected individuals charged with cost-sharing and maintenance.

At present, private users in the territory can pick up the strongest satellite signals from countries such as Australia, Japan, Indonesia and the Soviet Union.

Because of the limited programs obtainable in Hongkong and the high cost of satellite dishes, ranging between $30,000 and $60,000 each, it was considered impractical to relax the law to allow individual households to erect their own dishes on rooftops.

But even a partial relaxation of the law as currently proposed could mean a potential loss of revenue for Cable and Wireless, the company which now has exclusive rights to all satellite transmissions.

Cable and Wireless, which owns the Intelsat earth station at Stanley, passes on pictures to the territory's two TV stations, TBV and ATV, by microwave.

The British company, which is one of two major bidders for a franchise to operate cable television, now owns five satellite dishes and has investments in related services running into hundreds of millions of dollars.

/9738

JAPAN

Telecommunications Minister To Visit UK, France

55600027 Tokyo KYODO in English
1259 GMT 21 Apr 88

[Text] Tokyo, 21 April KYODO—Posts and Telecommunications Minister Masaaki Nakayama will visit Britain and France between 28 April and 7 May, it was announced Thursday.

The primary purpose of the visit is to attend the fifth annual meeting on telecommunications between Japan and Britain, the Posts and Telecommunications Ministry said.

Nakayama will confer with British Secretary of Trade and Industry David Young during the 5-6 May meeting, ministry officials said.

He is also scheduled to meet with French officials prior to the London talks.

/12913

JAMAICA

$62 Million Investment in Telecommunications Planned

55400044 Kingston THE DAILY GLEANER in English 11 Apr 88 p 1

[Article: "$3,300-m Investment Over Next 5 Years, says Charles"]

[Text] During year there will be US$62 million (J$341-m) investment in the telecommunications industry, according to the Minister of Public Utilities and Transport, Mr. Pearnel Charles.

Speaking at the annual long service awards ceremony of the Jamaica International Telecommunications Limited (JAMINTEL) on Saturday night at the Terra Nova Hotel, Mr. Charles said that the year 1988 to 1989 was poised to see "the greatest development of telecommunications in Jamaica".

He said that at present the Government was in discussions with the Japanese Government for a massive loan to support, extend and develop the telephone system in Jamaica.

Presently, 4,000 telephone lines are being provided but through this investment they expect to provide between 8,000 to 10,000 telephone lines.

Further development would also entail the replacement of old equipment, re-building of old plants and the increase of the company's ability to provide better services.

In all, over the next five years there will be a total of US$600 million (J$3,300-m) worth of investment in the industry: US$62 million (J$341-m) in 1988; US$22 million (J$121-m) in 1989; US$321 million (J$1,765.5-m) by 1990; US$163 million (J$896.5-m) by 1991 and US$86 million (J$473-m) by 1992.

Referring to the merger of JAMINTEL, Jamaica Telephone Company and Cable and Wireless, Mr. Charles said that there would be "no lay-off" of workers as a result of this. This merger has brought together all the assets of these companies.

"I have had no instructions to reduce wages at JAMINTEL," the Minister said. Workers at JAMINTEL receive higher wages than those at the JTC.

"I am confident that the new partnership with Cable and Wireless will add to this new expanded development of the industry," he said, adding that the partnership with the American company, AT&T "can only spell massive development for Jamaica".

"This year will also be the year of development in transportation. Another three hundred buses are expected to arrive in the island in the next three months," Mr. Charles said.

Four employees of JAMINTEL received long service awards: Harry Hawkins, a senior vice-president in the organization, for 40 years service; Colville Rickards and Dillon Webster for 30 years of service each, and Steinson Findlay, for 20 years of service.

/12223

BANGLADESH

Indigenous Phone Sets, Exchanges in Production

55500106 Dhaka THE NEW NATION in English 15 Mar 88 pp 1, 8

[Article: "TSS Produces Magneto Exchange"]

[Text] Telephone Shilpa Sangstha at Tongi, the only manufacturer of telecommunication equipment in the country has developed and produced a magneto exchange and magneto telephone set. Technological Development Division of the Sangstha as a measure of import substitute has designed and developed this exchange and telephone set by introducing electronic circuit in place of hard generators.

In the meantime, Bangladesh Telegraph & Telephone Board after a trial demonstration has approved the production of this newly developed magneto exchange. This exchange has a capacity of 100 lines and is capable of working together with CB and auto-exchange. The capacity of 100 lines can be increased or decreased as per demand. Magneto exchange is generally installed at a place where there is no electricity or the places having frequent power failure. As such, the remote areas of the country can be provided with telephone connections with the aid of this magneto exchange. The cost of this new exchange will be about one-third of the imported exchange.

Telephone Shilpa Sangstha has also taken up a project of production of Electronic Pushbutton telephone set and it is expected that the organisation will start manufacturing these new sets from the beginning of the next year.

Besides, TSS has prepared a project of manufacturing digital electronic exchange equipment amounting to TK 25 crore and submitted it to the Government for approval through Telegraph & Telephone Board.

/12223

INDIA

Building of Satellite Center Discussed With USSR

46001384 Madras THE HINDU in English 28 Mar 88 p 1

[Text] Hyderabad, March 27—Talks are on between India and the Soviet Union to build a satellite launch centre in the country. The site for the centre to be built with Soviet help is yet to be selected by India.

Dr. V.P. Opliatov, member, USSR Space committee, said here today that the talks being held by Indian and Soviet scientists followed the signing of an agreement on cooperation in space by the Prime Minister, Mr. Rajiv Gandhi, and the Soviet leader, Mr. Mikhail Gorbachev.

Dr. Opliatov, who visited the balloon research facility of the Tata Institute of Fundamental Research near here, said the scientists engaged in balloon research could associate themselves with the Soviet project for launching a probe to Mars in July.

Dr. Valery S. Roudnitsky, member of the USSR State Committee on Science and Technology, and Dr. Opliatov were in Hyderabad for an exhibition of photographs on the Soviet space programme at the B.M. Birla Planetarium here.

Dr. Opliatov presented to Dr. Sidharth, Director of the Planetarium, a picture of the city of Delhi, taken from space with a camera having resolution of five meters.

Congratulating Indian scientists and engineers on the successful launching of the Indian Remote Sensing-1A satellite, the "first completely Indian-built satellite," Dr. Opliatov said the Soviet Union was involved in every aspect of the IRS-1A. The satellite was to have been launched in 1986, but there was a delay of two years. "Launching a satellite is easy, but after the satellite is put in orbit, there is need for constant monitoring. We worked very hard for seven years to prepare for this launch. There were many specific engineering problems, for example, such as the one to match the spacecraft (with the launch vehicle). We had to develop two mathematical models on computer. The problems we had piled up to one metre high," he said.

The cameras with resolutions of 72 metres and 36 metres on board the IRS-1A were better than those on the American Landsat satellites.

Asked why cameras with greater resolution were not preferred for the satellite, Dr. Opliatov said, "The question should be posed to the Indian scientists."

PTI reports:

The proposed space centre, Dr. Opliatov said, would be able to launch geosynchronous satellites weighing around four tonnes, as against the two tonne satellites, which the Soviet launching stations were now able to put in space.

The higher capacity, he said, was because of the lower latitude on which the Indian centre would be located as the equatorial spin would act to its advantage.

The space centre would have Protontype launchers. The project was still at the discussion stage and it was difficult tc say when after a decision was taken, it could become functional. It all depended, he said, on the speed with which the ground facilities were built.

The Soviet space scientist said discussions were also in progress on the launching of another Indian satellite and use of Indian microwave equipment in the Soviet Union.

Earlier, speaking at the Planetarium on the Soviet "Phobos" project to study Mars, he said 12 countries and two international organizations were connected with the project.

/06662

Remote Sensing Satellite Transmitting Regularly

BK0505042288 Delhi Doordarshan Television Network in English 1600 GMT 4 May 88

[Text] The country's first remote sensing satellite, IRS-1A, is regularly sending picture signals. Its self-scanning sensor cameras take images of earth resources. These images are received in the form of picture signals at Shadnagar earth station near Hyderabad.

The signals are recorded on high density digital tapes. A quick look to the [words indistinct] system enables a scientist to study the pattern of coverage. The tapes are converted into smaller categories of the required area.

They are then developed into photographs which are distributed among the user agencies. These photographs are of immense help in surveying natural resources in the fields of agriculture, geology, hydrology, and meteorology. The satellite, which was launched on the 17th of March, takes about 14 rounds of the earth in 24 hours.

ADB Loan for Telecommunications

BK2704100188 Delhi Domestic Service In English 0830 GMT 27 Apr 88]

[Text] The Asian Development Bank has approved a $135 million loan to India to improve telecommunications facilities in the country. The loan to be paid back within 24 years is to meet the entire foreign exchange component of the $247 million telecommunications project. Under the project digital facilities will be provided to a number of telephone exchanges to modernize them. Earth satellite stations will also be set up at some places.

IRAN

TV Transmitter in Lorestan

LD280256 Tehran Domestic Service in Persian 1030 GMT 27 Apr 88

[Text] With the inauguration of the sixth satellite station in Lorestan Province, the inhabitants of eight villages in the Pol-e Dokhtar district will fall under the coverage of the first network of the Vision of the Islamic Republic of Iran. According to a report by the Central News Unit, the design, installation, and operation of this transmitter, which has 10 watts of power and 100 watts transmission capacity, was carried out by Television and FM transmitter units repair personnel of the Voice and Vision of the Islamic Republic's Khorramabad center installation.

BELGIUM

Belgium's ACEC in ESPRIT Fiber Optics Project

5500a032 Brussels NOUVELLES DE LA SCIENCE ET DES TECHNOLOGIES in French Oct 87 pp 175-178

[Article by Joseph Collard, engineer at the Telecommunications department, Telecommunications and Computer Communications division, of ACEC, Charleroi: "Presentation of a Fiber-Optic Wideband Local Area Network"; references as provided by source]

[Text]

1. Introduction

1.1. The Need for Interconnecting Local Area Networks

The local area network (LAN) seems to be the medium of the future for interconnecting data processing systems in offices and workshops.

In step with the development toward workstations with ever higher processing capacities, communication needs are growing from several kilobits per second for terminals to several megabits per second for file transfers between host and workstation.

Market trends and the work of standardization organizations show that several types of LAN's will coexist in large companies.

It is likely that each network will be part of a product line sold by a single manufacturer and that different networks will have to exchange information.

In addition to the problem of interconnecting different LAN's, another problem arises when these networks are spread across a large area, such as a campus or an industrial park, or even an administrative village. Few efficient means of communication exist that can cover such an area.

1.2. ESPRIT Project 73: BWN

The BWN [Backbone Wideband Network] project attempts to solve both problems—interconnecting different networks and covering a large area.

It involves the development of a complete communication system based on a central network (backbone) attached to large-capacity gateways giving access to the various types of local networks, wideband consumer services (PTT network), and satellite links (Figure 1).

A prototype is being built which will be installed on the Sart Tilman campus at the University of Liege.

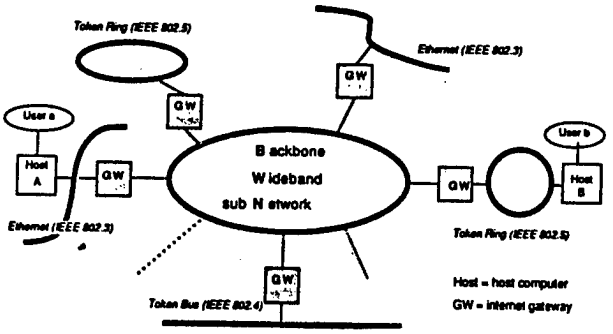

Figure 1. Global Network Topology

The project is subsidized by the Commission of the European Communities as part of the ESPRIT program, code-named Project 73.

The partners in the project are ACEC [Electrical Construction Works of Charleroi] (Belgium), main contractor in charge of the Backbone network itself; the University of Liege (Belgium), in charge of basic research, specifications, and performance rating; BTM [Bell Telephone Manufacturing] (Belgium), constructors of the gateway to public carriers; SG2 (France), builders of the satellite link; and Stollmann (FRG), constructors of the gateways toward the different types of local networks.

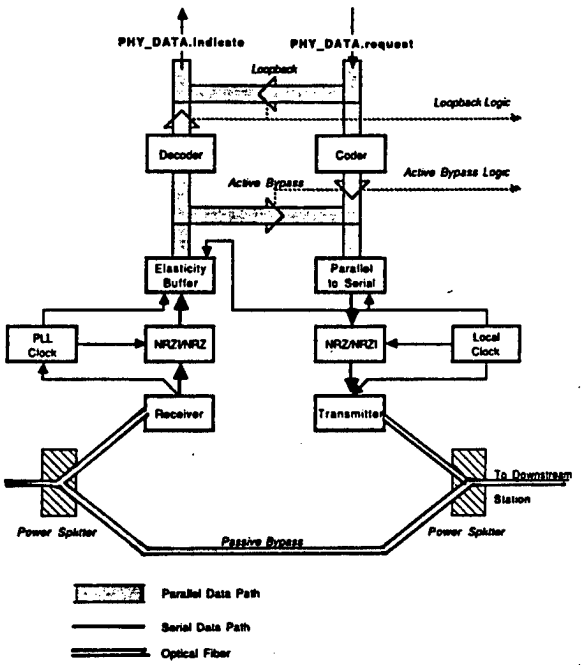

Figure 2. Network Architecture

2. The Physical Layer

2.1. General Description

This description covers only the main characteristics of the physical layer.

Designers drew on data transmission techniques used by public telecommunications services because of the distance to be covered and the throughput required.

Therefore, optical fibers were chosen as the transmission medium and the 1300-nm window was selected because its components were readily available at a competitive cost.

However, these choices do not rule out a subsequent switch to monomode fibers and a 1500-nm wavelength when the optical components in this line become competitive for short distances and can be used in numerous flexible connections.

The fiber's binary transmission rate was set at 167 Mb/sec, the usual rate for point-to-point fiber-optic lines.

With these parameters, existing optical interface circuits can be used.

In fiber-optic transmission systems, information must almost always be coded in order to eliminate low-frequency energy from the baseband signal.

Information is naturally divided into packets, as in a data processing network. So the optimal transmission system should make use of this structure and provide functions such as packet delimitation and transmission control. Therefore, a code set meeting these needs was chosen, including an 8b/10b block code followed by an NRZ/NRZI serial bit code.

In addition to the 256 words used for data, a series of flag words is available providing information on the condition of the carrier packet delimiters, and transmission control markers. This coding format is quite similar to the one proposed by the ANSI standard for the FDDI (6).

The BWN does not use a central clock to control data transmission along the ring. Instead, the nodes are "plesiochronous," meaning that each one uses its own local clock to control transmission.

Binary signaling can be recreated by means of a clock reader circuit so that the received signal is correctly sampled.

A special circuit, called the "elasticity buffer," readjusts the incoming data to the local clock.

2.2. Physical Layer Architecture

The architecture of the physical layer is shown in figure 3.

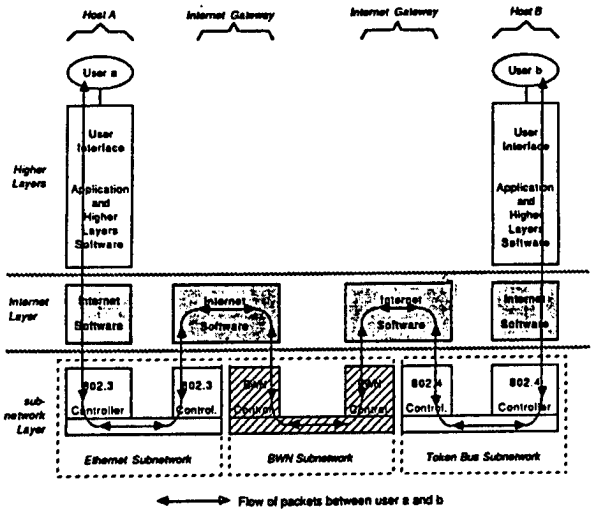

Figure 3. Functional Diagram of the Physical Layer

The incoming signal is detected by an avalanche photodiode (APD) and the optical transmitter is a LED [light-emitting diode] or laser diode.

The NRZI/NRZ decoder and the elasticity buffer are located upstream from the optical detector and its related electronic components.

This setup can be described as a FIFO (first-in, first-out) register.

After data has been resynchronized with the local clock and converted into 10-bit words, the words are decoded into 8-bit data with a 9th bit indicating the tag codes used on the 8 data bits.

The transmission route reverses the process.

In addition to these basic functions, several bypasses are provided to ensure automatic verification and to handle situations of crippled mode operation.

3. The MAC (Medium Access Control) Layer

3.1. General Description

A brief description of the specifications of the BWN's MAC layer shows that it has a lot in common with the ANSI standard proposal for the FFDI (7) and the IEEE 802.5 standard (8).

Simulations (4) have shown that desired performance levels could not be achieved with the priority mechanism. In any event, BWN's binary throughput capacity is so much higher than that of connected networks that the need for priority access is superfluous.

Interestingly enough, the FDDI proposal contains a passband reservation mechanism, essentially for synchronous services, but it did not retain the IEEE 802.5 priority mechanism either.

In the BWN setup, the synchronous and asynchronous services carriers are kept apart except for those synchronous services that require negligible portions of the system's passband.

This was a deliberate architectural choice designed to obtain the best possible means of communication for one type of traffic.

Since the BWN network is the backbone communication system, access cannot depend on the state of the connected gateways.

This is why the network access controller is capable of starting up on its own and connecting to the ring. The individual node addresses are thus stored in the controller.

A set of statistics has been defined, along with a state machine to access them, so that the network can be managed more easily and problems can be analyzed.

3.2. Interface Between the BWN Access Controller and the Host System

A standard interface, separate from the architecture of the host system, has been developed to access the BWN controller.

This setup requires a communication controller within the host system itself adapted to the BWN-AS interface. It also implies that only this controller has to ensure the adaptation to connect the BWN to a host system.

3.3. Architecture of the MAC Layer

Implementation of the MAC protocol described above requires several interconnected machines (9).

The first machine is in hard-wired logic. Essentially, it synthesizes the protocol's basic state diagrams. These state machines are synchronized with the BWN network.

At the other end, a second semiprogrammed machine manages the user interface so that access to the interface by the host system is as independent as possible from the internal state of the controller.

A third, programmed machine rounds out the trio for more complex or more intelligent operations requiring less speed.

This machine also provides overall monitoring of the controller.

Unlike many other network controllers, the BWN controller has a very large internal storage capacity which can be accessed via the network's throughput.

E. Vyncke and A. Danthine (5) showed that this large capacity was needed to smooth out traffic peaks that come from BWN and must be routed through the gateway.

This absorption of traffic fluctuations is linked to the vast difference in the throughput capacity of BWN (140 Mb/sec peak) and that of the gateway (2 Mb/sec on average in full duplex mode).

FIFO memories at the interface toward the host system can temporarily hold as much as an entire frame so that the host system can use the interface's passband to its best advantage, regardless of the controller's traffic.

Conclusions

BWN is one of the local networks with the largest passbands.

A specific architecture has been developed to achieve these performance levels.

The prototype of the BWN should be online in the first half of 1988. It will offer an original solution for interconnecting data processing systems of the future.

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FEDERAL REPUBLIC OF GERMANY

Cabinet Plans Restructuring of Bundespost Services

DW130930 Frankfurt/Main FRANKFURTER ALLGEMEINE in German 13 May 88 p 13, 14

[Article by "KB": "Postal Restructuring With Strong Telephone Monopoly"]

[Excerpt] Bonn, 12 May—After difficult discussions, the Federal Cabinet adopted a draft for the planned restructuring of postal and telecommunications services and the German Bundespost. A complete reorganization is not in the works, said Post Minister Schwarz-Schilling, but instead a significant structural improvement, so as to develop communications services and their technology dynamically to the advantage of customers and postal employees. The growing telecommunications market must be fully exploited as a key factor in the industrial state. This is to be facilitated through more competition and through the separation of postal responsibilities and entrepreneur tasks in three connected public enterprises—postal services, postal banking, and telecommunications.

The Federal Government, however, is sticking to its intention to permit only limited competition. The Cabinet decision emphasized that the postal monopoly for mail, the telephone network and telephone service will continue unlimited. As to other postal services, private firms will be admitted. Because the postal service has reserved for itself the expansive and profitable telephone service, Schwarz-Schilling considers the fears of the trade union and the opposition unfounded that postal finances could collapse because of reform, which will be gradually implemented starting in 1989.

TV-SAT 2 To Be Launched

LD1205032588 Hamburg DPA in German 1331 GMT 11 May 88

[Text] Hanover (DPA)—The direct broadcasting German satellite TV-SAT 2 is to be completed by 30 April 1989 at Messerschmidt-Boelkow-Blohm Gmbh (MBB) and delivered to the German Bundespost. Two months later it is to be launched, according to the plans of those responsible, with the new "Ariane 4" rocket from Kourou in Guiana. A spokeswoman for MBB announced this at the International Air and Space Travel Exhibition (ILA'88) in Hanover today. After the breakdown of TV-SAT 1, which did not function because of a fault in one of the solar generators, the new construction is to become a "show piece" according to the manufacturers, Eurosatellite/MBB. TV-SAT 2 will cost DM189 million.

ITALY

ESA Plans for Land Mobile Satellite Systems Outlined

5500m295 Milan ALTA FREQUENZA in English No 10, Dec 87 pp 449-452

[Article by Alex Steciw of the European Space Agency, Paris: "European Plans for Landmobile Satellite Communication System"]

[Excerpt] Considering the rapid expansion of cellular systems in Europe and the prospect of the future pan-European system which is planned for the 90's, the first questions which come to one's mind are what is the future of satellite-based systems in Europe and what role can they play?

2. The Use of Satellites for Mobile Applications in Europe

In many circumstances, one is tempted to compare satellite communication techniques to classical systems, on the basis of criteria which are only applicable to these systems. This is particularly true in the land-mobile communications field where cellular systems are opposed to satellites. In that context, it is obvious that a satellite system could not compete with the existing European mobile systems, let alone with the future pan-European system.

Satellite systems cannot compete in respect of system capacity, cost, spectrum efficiency, etc. However a satellite system should be considered for what it can best provide, i.e.:
—wide area coverage
—flexibility

Wide area coverage is certainly a major point in favor of satellites, as it allows the extension of the system coverage to coastal waters and to regions which are economically important to Europe, e.g. the Middle-East and

North-Africa. It also offers the possibility to complement radio cellular systems in low density areas. However, this feature raises the problem of system and frequency compatibility.

Flexibility is also a major advantage for the satellite system; this can be translated in terms of fast implementation of new services, but also of ability to adapt to new situations.

A satellite-based system would also enable the provision to potential users of private wide-area mobile communication networks with direct access to the satellite from small earth stations on the user's premises. Such a facility might also be offered in a cellular system but only for local applications (e.g. in one or two cells). Market studies that have been performed for the Agency have shown there is a great interest in Europe in such private networks. Table 1 gives the number of European trucking companies that would use such facilities as a function of their fleet size (number of trucks).

Table 1. Potential Demand for Private Wide Area Networks (European Trucking Companies)

Fleet size	50-74	75-99	100-249	250-499	500 and more
Potential demand	1050	700	522	50	20

The number of large European road freighters that would use private wide-area networks is about 140, most of them exploiting fleets of at least 800 trucks. It must be noted that the above forecasts apply to the year 1987.

With only a few exceptions, the potential users as defined above are primarily interested in intelligible voice communications although the availability of low speed data and facsimile services in complement to the basic voice communication services is generally perceived as a plus.

In order to meet the corresponding mobile communication traffic requirements, a number of voice channels (4.8 kbit/s vocoder quality) of 3000 to 4000 would be needed. It is worth noting that assuming the annual lease charges per voice channel (60 to 85 kdollars) that have been used in the framework of above mentioned market studies, a minimum satellite capacity of 200 voice channels would be required in order to make the satellite option profitable.

Wide area paging is another application for which satellites are particularly well suited. The size of the corresponding market in Europe is estimated at 4 to 5 million subscribers.

Wide-area paging could also be used as an ancillary service to support the search/localization function that will have to be implemented in the future pan-European cellular network and which is likely to be complex and time-consuming.

3. ESA Activities in the Field of Land Mobile Satellite Systems

In addition to basic market studies that have already been presented, a number of activities have been initiated by ESA in preparation of future land mobile communication satellite missions. These activities encompass experiments and demonstrations as part of the PROSAT program, now in its second phase, mission and system studies aiming at the definition of experimental pilot systems (LAMEX, ARCHIMEDES) to be implemented in the framework of the PSDE program (Payloads and Spacecraft Development and Experimentation) in the early 1990s.

The PROSAT program encompasses the three basic fields of applications of mobile communications, namely maritime, aeronautical and land mobiles. Amongst the 30 terminals that have been developed for the purpose of Phase 2 demonstrations, 10 are land mobile terminal that are currently being installed on trucks and other types of vehicles. Due to the fact that the PROSAT program relies on the use of an existing satellite (MARECS) that is being exploited by the INMARSAT organization, the scope of the program had to be restricted to data communications only, the satellite being already loaded with the maritime communication traffic.

Based on the experimental data that were gathered during Phase 1 of the PROSAT program, a number of system concepts were defined and analyzed. One of them, named PRODAT, has been implemented for the purpose of Phase 2 demonstrations. PRODAT is a low data rate system which is suitable for very simple land mobile terminals using very low gain antennas (0 to 1 dB).

The PRODAT system that has already been tested and commissioned provides the full range of low data rate services that could interest potential mobile users, namely:
—sending of messages from fixed to mobile users and vice versa, and from mobile to mobile users
—sending of messages to multiple users (broadcast)
—request/reply functions
—periodic polling of mobiles, and
—paging.

The system has been designed to operate with satellites of the present generation, such as MARECS, and to cope with deep fades or even complete black-outs that may occur in certain circumstances in a land mobile link, in

particular at low elevation angle and when the link visibility is affected by buildings, bridges, trees (with or without leaves) and mountains.

Proposals for a new program of trials and demonstrations in preparation of pilot satellite systems to be implemented in the framework of the PSDE program are currently being discussed with member States. This program encompasses two categories of activities:

—trials and demonstrations aimed at exploring ways of including telephony in a geostationary satellite system, and involving the development and the demonstration of two enhanced land mobile terminals with antenna gain in the range of 10 to 12 dB, one with automatic azimuth pointing (for communications while driving) and another with manual pointing (for communications when standing still). Two types of satellite network will be demonstrated, namely a public network providing toll telephony quality, and a private network providing telephony of lesser quality (e.g. 2.4 kbit/s vocoder quality). These trials and demonstrations will rely on the use of the MARECS satellite.

—tests of land mobile communication links at high elevation angles (above 30 degrees) intended to assess and quantify experimentally the advantages and merits of non-geostationary satellite systems. Due to the fact that future satellite land mobile services are likely to suffer from a shortfall in frequency spectrum availability, propagation tests will be performed at both L- and S-band. As MARECS cannot be used because of obvious frequency bandwidth and elevation angle limitations, it is proposed to carry out these tests by helicopter. Other means of providing high elevation angle links at L- and S-bands are also being considered (e.g. balloons, existing satellites with S-band payloads, GPS, etc.).

As regards system options to be adopted for future land mobile communication satellites, a number of critical issues still need to be clarified. Investigations are being conducted by ESA in order to compare all potential satellite options, including both geostationary and non-geostationary satellite systems.

The pros and cons of geostationary satellite systems are well known and several satellite bus designs (OLYMPUS, SPACEBUS, EUROSTAR) are available in Europe that could be used to carry a mobile communication payload providing up to 2000 voice channels (4.8 kbit/s vocoder quality). The required in-orbit capacity could be achieved with only two active satellites. The geostationary satellite option would also provide fixed coverage zones, and would ease the implementation of private satellite networks, as small gateway stations with no automatic pointing could be used. However, mobile communication services in Europe, in particular telephony, would suffer from low satellite elevation angles (typically 10 to 40 degrees) which could lead to a significant reduction of useful service areas within the satellite coverage. Furthermore, achieving the above channel capacity requires mobile terminal antenna gains in the range of 10 to 12 dB, which implies the use of a mobile antenna with either an automatic or a manual pointing system.

LAMEX (Land Mobile Experiment) is an experimental payload to demonstrate the capabilities of satellites in geostationary orbit to provide two-way communications (telephony and data) between base stations on the earth and land mobile terminals mounted on vehicles such as trucks, trains and automobiles. Three payload options are being studied. The coverage of one of the options providing both aeronautical and land mobile communications is shown in Figure 1. In the minimum option, dedicated to land mobile applications, the Atlantic spot beam is eliminated. All LAMEX payload options under study are expected to have a maximum mass and power consumption of less than 100 kg and 550 WDC respectively, (about 1/3 OLYMPUS). The minimum option could easily provide a capacity of 200 voice channels (4.8 kbit/s vocoder quality) for enhanced mobile terminals (10 to 12 dB antenna gain) and additional channels for low G/T mobile terminals. LAMEX is designed to accommodate both private and public satellite networks. The antenna diameter of 11/14 GHz "private" fixed earth stations is in the order of 1.8 m. LAMEX is one of the pilot system options to be implemented in the framework of the PSDE program.

Other system options which deserve consideration and which are being investigated by ESA rely on the use of non-geostationary orbits, and more specifically on geosynchronous highly inclined elliptical orbits. Although there exists a large variety of such orbits, the most interesting ones appear to be MOLNIYA (63.4 degrees inclination, 39 105 km apogee, 1250 km perigee, about 12h period) and TUNDRA (63.4 degrees inclination, 46 340 apogee, 25 231 km perigee, about 24h period). Figure 2 shows a MOLNIYA network comprising three satellites properly phased and moving in three different orbital plans spaced by 120 degrees. The three satellites of the network are used sequentially for a time period of 8h when they are near their apogee above Europe. The basic advantage of such a satellite network is the minimum satellite elevation angle which is above 55 degrees in all European countries and well above 60 degrees in most of them (Figure 3). With TUNDRA orbits full-time coverage can be provided with only two satellites, however, the minimum satellite elevation angle goes down to about 35 degrees. With three satellites the same performance as in the MOLNIYA case can be achieved.

The improvements in overall system performance and service quality that higher satellite elevation angles could lead to are difficult to quantify as no experimental data are available. Non-geostationary satellites would, in particular, enable the adoption of higher mobile antenna gain (e.g. 7-8 dB) without any need for automatic or manual pointing. Furthermore, multipath effects would be eliminated and propagation fadings due to obstacles

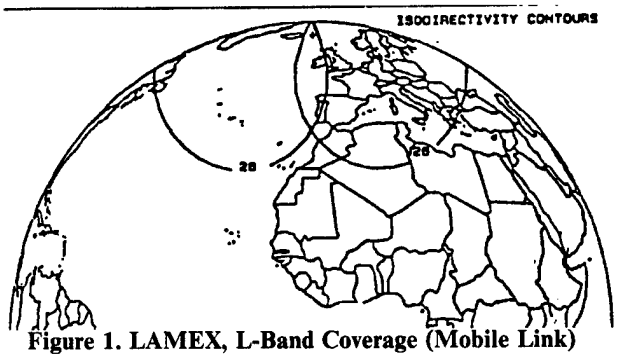

Figure 1. LAMEX, L-Band Coverage (Mobile Link)

considerably reduced. This should result in a significant reduction of required link margins and/or an extension of useful service areas within the satellite coverage.

ESA is conducting mission and feasibility studies in order to assess the technical and economic viability of non-geostationary satellite system options and to define an experimental pilot system (ARCHIMEDES) in the 1990s. As attractive as they may look, MOLNIYA or TUNDRA types of satellite network raise a number of problems that need to be carefully investigated. The optimal launching and in-orbit replacement strategies are perhaps the most critical ones as they might have a very strong influence on overall costs. The orbit stability and orbit control requirements, the communication system aspects (e.g. antenna pointing/zooming requirements, power control, frequency re-use, satellite changeover procedures, implementation of private networks), the overall satellite bus architecture, and the economic comparison of both geostationary and non-geostationary satellite options are also parts of above-mentioned studies that are likely to be completed by mid-1988.

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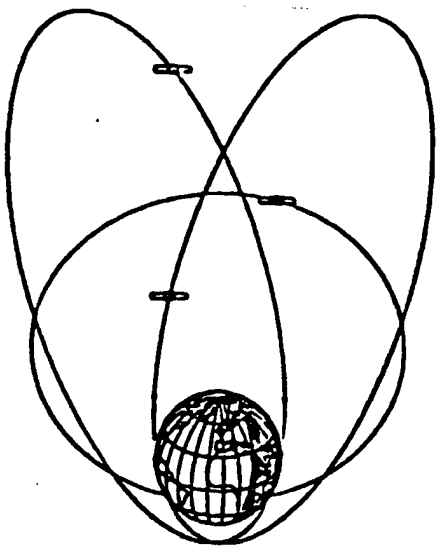

Figure 2. MOLNIYA Network (as seen by a fixed observer)

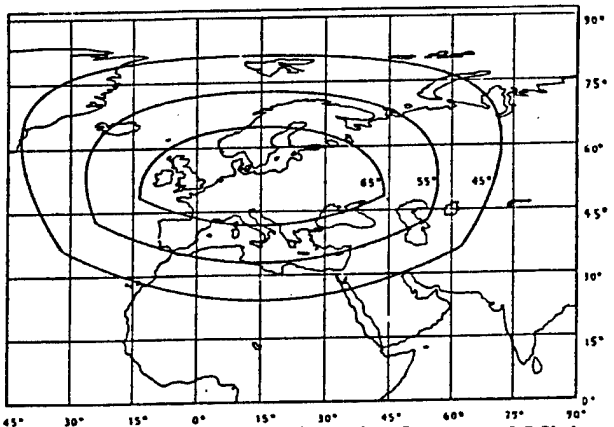

Figure 3. Coverage Boundaries With Guaranteed Minimum Duration Angle (use of 3 MOLNIYA)

Evolution of European Cellular Communications Reviewed

5500m294 Milan ALTA FREQUENZA in English, No 10, Dec 87 pp 445-448

[Article by Renzo Failli of SIP [Italian Telephone Company] and Pietro Porzio Giusto of CSELT [Center for Telecommunications Research and Laboratories]: "Evolution of Cellular Mobile Communications Systems in Europe"]

[Excerpts] Since the end of the 70's the demand for mobile radio experienced a very rapid expansion (Figure 1), and the need for a mobile two-way telephony, offering, at low-cost, quality and facilities similar to those available in the fixed network, arose. Therefore an incredible amount of research was undertaken to design new advanced systems, able to make land mobile communications accessible to millions of subscribers on a variety of mobile transports, and the World Administrative Radio Conference (WARC) held in Geneva in 1979 alleviated the shortage of bandwidth by allocating in the 900 MHz band about 100 MHz bandwidth for mobile radio applications. The Conference Europeenne des Postes et Telecommunications (CEPT) chose the two sub-bands 890-915 MHz and 935-960 MHz for the implementation of a European public land mobile radio system.

But the home market of any single European country is too small to alone support an independent cellular development with so advanced characteristics, so that the CEPT instituted the GSM (Groupe Special Mobiles) with the task of issuing harmonized specifications for a pan-European mobile communications system; a number of consortia among telecommunications industries

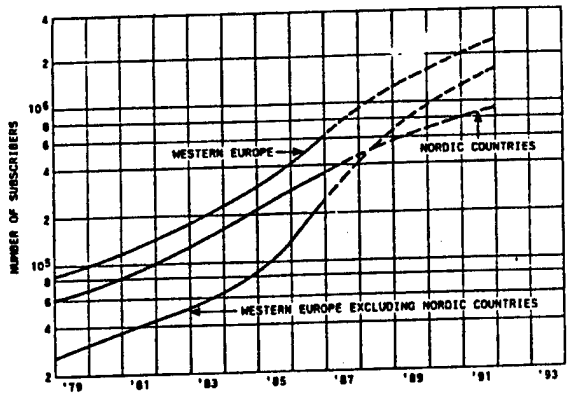

Figure 1. Development of Public Mobile Radio in Europe

were set up and a Co-operation on Science and Technology project, namely COST 207 ("Digital Land Mobile Radio Communications"), was appointed.

The work of these Committees is going on with the goal of defining the specifications of the pan-European system by the end of 1987, in order that the system can be brought into service in 1991.

The next chapter presents an overview of the most important public land mobile radio systems currently in operation in Europe, with some comment on their development and their forecast saturation; then the characteristics of the pan-European system will be sketched; finally some perspective on what is coming next is offered.

2. Current Systems

Figure 2 summarizes the history of the land mobile radio systems in Europe, indicating country by country which frequency bands have been used and which type of systems have been developed.

In Europe the most advanced cellular systems in operation today are:

—NMT/450 (Nordic Mobile Telephone operating at 450 MHz), in Denmark, Finland, Norway, Sweden, Spain and Iceland;

—an NMT/450-like system in Holland, Belgium, Luxembourg;

—an NMT/450-like system in Austria;

—TACS (Total Access Communication System), in UK and EIRE [Ireland];

—NET-C, in the Federal Republic of Germany;

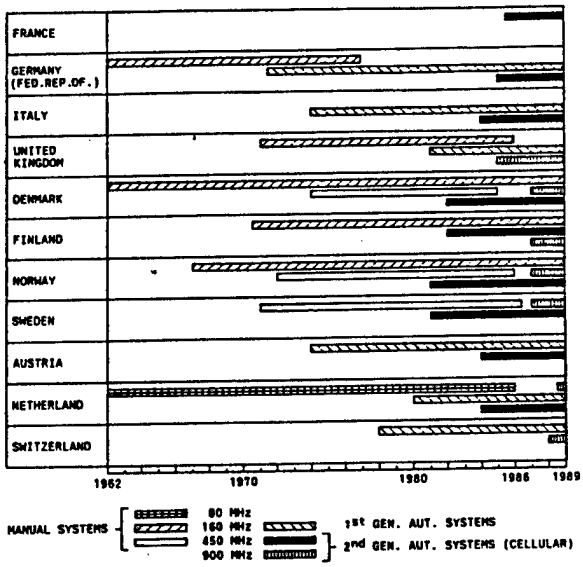

Figure 2. Main European Public Mobile Radio Systems With National Coverage

—Radiocom 2000, in France;

—RTMS (Radio Telefono Mobile di Seconda Generazione), in Italy.

Most of the above mentioned systems operate in the 450 MHz band, except for TACS, which operates in the 900 MHz band and Radiocom 2000, which operates in the 450 MHz band for nationwide service and in the 200 MHz band for local service; but none of them are mutually compatible, so that travelling people cannot keep into contact when they cross the borders of their countries (except for few cases like the Nordic countries).

The systems operating in the 450 MHz band with about 200 channel pairs are expected to be capable to accomodate 10,000 to 30,000 subscribers in each metropolitan area, which should be sufficient in most cases up to the deployment of the pan-European system. But in many European countries the capacity of those systems will be saturated before that event, so that, to cope with the demand, they will (some already have) put into operation analog, interim solutions in the 900 MHz band. This is the case of the NMT/900 system (an NMT/450-like system, but operating in the 900 MHz band), which has been put in operation in the Nordic Countries in 1986, and which will be also put in operation in Switzerland in September 1987 and in the Netherlands by the end of 1988 or the beginning of 1989. So the opportunity to replace or up-date the land mobile radio systems will occur at a different time in each country.

3. The Pan-European GSM System

As said above, by the end of 1987 the CEPT/GSM will issue specifications for a harmonized pan-European system, which is expected to be brought into operation in 1991. The specifications will be in agreement with the following requirements:

a) The system will be implemented in the sub-bands 890-915 MHz and 935-960 MHz, ensuring compatibility, from the frequency sharing point of view, with existing systems working in the same bands;

b) the mobile stations will be able to roam about all the participating countries (preferably to all CEPT countries);

c) the offered services and facilities shall be at least the same as those available in the public switched telephone networks and the public data networks;

d) the system shall cover coastal and inland waters as an extension of the land mobile service in order to allow operation with ships sailing nearby the mainland;

e) no significant modification of the fixed telephone network shall be required to operate the system;

f) an international standardized signalling system shall be applied for the interconnection of the mobile switching centers.

In addition to the above mentioned requirements, a number of additional features could be provided by the pan-European system, such as:

—encryption, improving the privacy of communications, applicable to both speech and data,

—virtual closed user groups, enabling a group of users of a public mobile system to communicate with each other, while barring access to and/or from users outside the group, and a number of other additional services fulfilling the needs of any professional and business use.

The GSM system will extensively use digital technology, with an advanced coding scheme for speech at a net bit rate of 13 kbit/s, but designed in such a way that it will be capable to operate with coded speech at a bit rate half than that, thus doubling its capacity when that technique will be available.

A narrowband TDMA (Time Division Multiple Access) scheme will be adopted with 8 traffic channels per carrier.

The bandwidth occupancy will be quite probably 25 kHz per traffic channel (in the early version), but its spectrum efficiency will be higher than that of the current analog systems using about the same bandwidth per channel, since co-channel interferences as high as - 12 dB to - 10 dB with respect to the wanted signal can be tolerated and, as a consequence, a more intensive frequency reuse can be adopted.

4. Conclusions

The very rapid increase of the demand for land mobile radio services requires the development of new systems with capacity substantially higher than that of current ones.

The new demand is for mobile systems offering quality and facilities similar to those available in the fixed networks, with additional features requiring advanced technology; this is a significant opportunity for Europe, which has a large potential market: the definition of a harmonized system and the cooperation among Administrations and Industries could allow a leading position to be achieved.

However the need for the new system is expected to arise at a different time in the European countries, while many of them will have to put into operation interim systems before the availability of the pan-European solution; therefore the success of the European harmonization will strongly depend on the date of its completion, and, in particular, on the penetration the interim systems will have got before it can start service.

To avoid a late birth, a reasonable trade-off must be achieved between time schedule and performance, and the risk of anticipating technology must be carefully considered.

In fact, the opportunity to apply more advanced techniques can be left to the personal communications, which will be able to provide mobile services to the general population by low-cost, small-size, portable units. This is what is coming next the land mobile radio systems we have talked about.

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Telettra Applications of Microwave Technologies Outlined

5500m293 Milan ALTA FREQUENZA in English, No 10, Dec 87 pp 429-436

[Article by Guido Vannucchi of Telettra S.p.A.: "Basic Technologies for Microwave Digital Radio Relay Systems: A Management Overview"]

[Excerpts]

Overview of Selected Basic Technologies

A brief description of a number of different technologies, as used by Telettra, follows hereafter along with the relevant applications. This will illustrate and explain the choices made by the company on the basis of the previous general considerations.

Mechanical Manufacturing Processes

This definition covers not only purely mechanical parts (i.e. racks, shelves, etc.) but also the mechanics involved in a set of microwave electrical components like filters, oscillators, circulators etc.

Even if its share in the total equipment content is decreasing, this area still remains very important for the cost and technical performance of the equipment. There is, therefore, a continuous need to invest in terms of:

- standardization,
- new materials,
- production automation.

Production automation is extensively supported by the pursuit of standardization itself.

Results of such efforts are illustrated in Figure 6 [not shown] showing the present generation of Telettra microwave filters from 2 to 18 GHz, while an internal view of a dielectric resonator filter is shown in Figure 7 [not shown]. Reduction in size, replacement of invar with dielectric material or aluminum and CAD-CAM procedures allow cost effective solutions and time saving in implementation of new frequency versions. In particular standardization of filter dimensions makes the use of die-casting economically viable.

The same considerations apply to waveguide circulators. Telettra waveguide circulators from 6 to 18 GHz are shown in Figure 8 [not shown] in support of the above statement.

It is obvious, however, that the solutions illustrated in the previous figure refer only to selected applications of circulators (like branching) while, whenever possible, lower cost microstrip "drop-in" solution on hybrid circuits are used. A review of "drop-in" Telettra circulators and isolators is shown in Figure 9 [not shown].

The construction of the above components is supported by heavy investment in flexible manufacturing system (FMS) directly connected to the CAD company system. Figure 10 [not shown] gives a view of Telettra's numerical control machines.

Surface Mounting and Hybrid Technology

Thin, thick film and duroid technology some years ago, along with more recent surface mounting on PCBs, have led to the use of large scale manufacturing techniques and to the automation of subassembly production for microwave equipment.

From the technical point of view, the use of "surface" mounted components (both active and passive) is particularly suitable for high-speed and high frequency circuits. Reduction of leads and wire length, together with a decrease in package parasitics, strongly contribute to the optimization of electrical performance as well as of cost and reliability.

Thick films are extensively used by Telettra for intermediate frequency circuits, as shown by the example of Figure 11 [not shown].

Surface mounting on PCB has been implemented mainly for baseband circuits where quantities are relatively large. As an example of these applications, the board of a protection switch is shown in Figure 12 [not shown].

This group of technologies is indeed particularly suitable for relatively high volume production. Nevertheless they can be advantageously used also for small quantity production since they contribute to a drastic reduction of the expensive turning procedures so typical for the high frequency circuits of the past.

Semicustom Monolithic Integrated Circuits

At Telettra, the use of a fast growing number of semicustom application specific integrated circuits (ASIC) in radio equipment is planned, even if it may be difficult to justify the development costs, given the limited number of gates and the reduced quantity per year. Nevertheless,

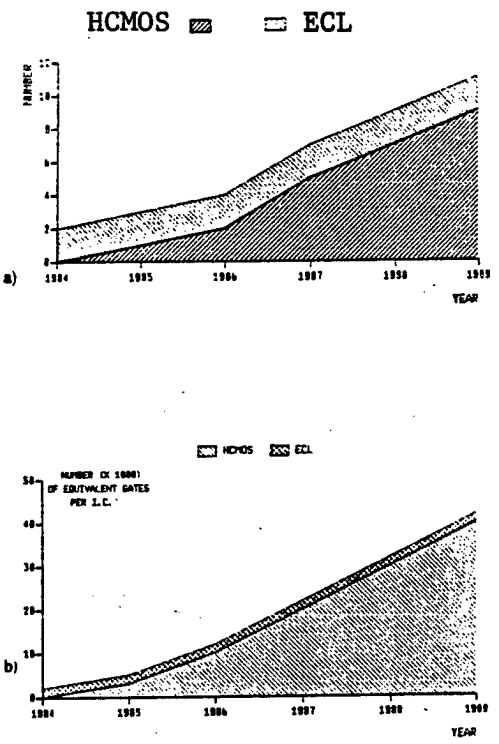

Figure 13. Growth of the use and complexity of semicustom ICs in Telettra Digital Radio equipment as measured by: a) number of new designs per year; b) number of equivalent gates per IC

the technological advantages of semicustom ICs (miniaturization, easy assembling, testability, etc.), with the resulting competitive advantages at the system level, are so significant that they too should be taken into account when evaluating the economic justification of the development.

The increasing use of semicustom integrated circuits in Telettra radio equipment and their level of complexity is shown in Figure 13. In particular they are used in the base-band of digital receivers because:

a) the very high speed modern A/D converters enable a fully digital implementation of all main baseband functions;

b) the increase of countermeasures at baseband (cross-polar canceller, constellation shaping etc., in addition to the more common multi-tap baseband transversal equalizers) demands semicustom solutions.

In order to support this trend, Telettra is improving the in house capability of dedicated software with a distributed network of work-stations that will allow direct access by each circuit designer to a central database for ASIC simulation.

Active Microwave Components

The Telettra case history of GaAs FETs development is of interest as an illustration of the approach adopted for the introduction of new active microwave components. A few years ago the increasing importance of GaAs FETs for microwave transceiver challenged Telettra with a difficult decision of "make or buy" policy.

FETs were affecting Telettra equipment considerably due to:
—their high impact on the overall cost;
—the strong dependence of equipment performance on component characteristics;
—very few suppliers with a satisfactory product offering.

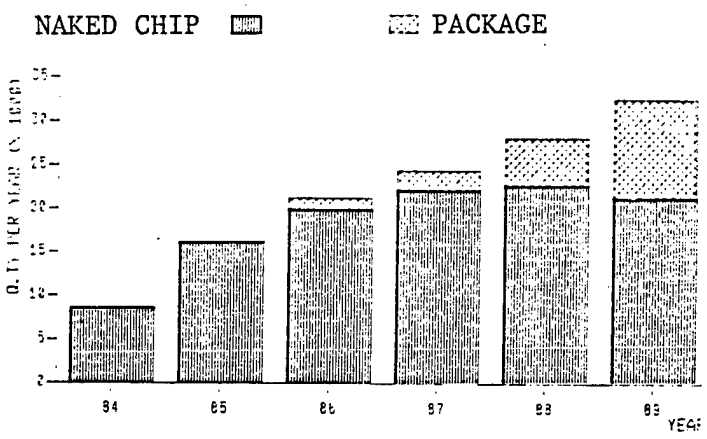

Figure 14. Growth of the quantity of power discrete GaAs FETs for Telettra use

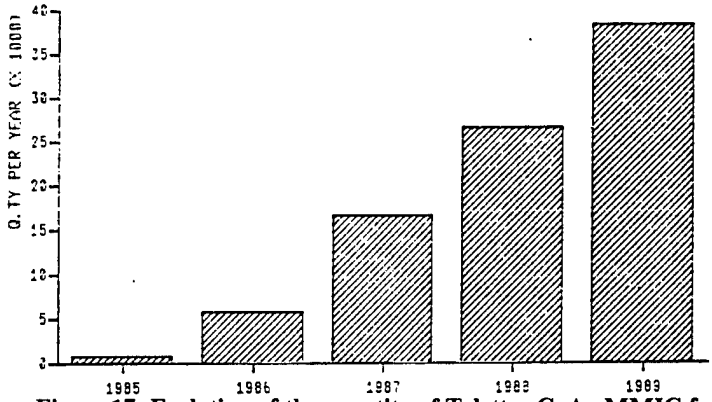

Figure 17. Evolution of the quantity of Telettra GaAs-MMIC for internal use

Supported by a large internal consumption volume (Figure 14), the decision was made to develop "in house" capability, but the internal effort was limited to the implementation of:
—high power, high efficiency MESFETs;
—analog GaAsICs.

Four years after that decision the results are well in line with the target in terms of return on investment, number of types, cost and production schedule of the devices. A section of Telettra GaAs facility is shown in Figure 15 [not shown].

In 1987 more than half of Telettra GaAs FET needs are covered with the internal production. In addition considerable value is attached to the fall-out obtained in terms of:
—cross-fertilization between system designers and technologists;
—better know-how for the design of new analog microwave circuits;
—large use of unpackaged chips in circuits thanks to the increased confidence in the technology;
—development of new more advanced devices with high efficiency (Figure 16 [not shown]).

Also an increasing use of analog GaAs monolithic microwave ICs (MMIC) is planned for Telettra equipment. Quantities are large enough (Figure 17) to justify the "in house" development of exploiting existing GaAs facility and know-how.

Microwave Integrated Circuits

Amplifiers and osciallators have come a long way from the old complex waveguide units to today's "super components."

The cavity stabilized invar oscillators which for a decade have been the work-horse of the company (with more than 30,000 units produced) are replaced by dielectric resonator oscillators with the resulting advantages in cost and performance. Figure 19 [not shown] shows such an oscillator operating at 6 GHz.

For amplifiers, the introduction of a modular approach which allows high level of standardization and simplifies production has been the most significant recent evolution in Telettra. The approach consists of designing a complete amplifier with "bricks," RF modular circuits, that can be produced with batch processes like components. At Telettra such bricks are referred to as micromodules (Figure 20 [not shown]) and they have many advantages:
—fully hermetic;
—matched impedance for easy assembling;
—fully screened for EMC protection;
—reduced parasitics with increase in bandwidth and gain.

For an overall amplifier (Figure 21 and Figure 22 [not shown]) the advantages are:

—reduced dimension;

—easier repair and maintenance;

—reduced turning time;

—better production flow.

Conclusions

The world of electronics is experiencing a "dematerialization" process, and microwave radio is no exception. Design and engineering efforts, cost and technical performance are focused on specialized and complex components, on technological processes, on software.

Digital microwave radio link techniques are still in the development stage. Design ability to improve system-path performance can still be a winning factor as far as it overcomes transmission difficulties with increased capacity.

However, most probably, at the link-system level sufficient maturity will soon be reached. Consequently, even for high capacity digital radio, the focus of competition will shift from system performance to equipment cost factors, including operational cost related to equipment dimensions, power consumption, reliability, etc.

All these parameters are controlled by the basic technologies. A company that wants to be among the leaders must use the most advanced of them at all times.

Moreover, competition will penalize technological errors, and short life-cycle does not permit tests on new technologies during the equipment implementation period. Consequently, it is indispensable to identify, select, implement and test new technologies well in advance with respect to their practical use.

Accordingly, since basic technologies for microwave radio are evolving at a very fast pace, their importance is rapidly growing, their control is essential for a company's success.

Therefore the "make or buy" policy for the production as well as for the development of an envisaged new process is a challenging task of strategic importance that the management of a company must consider with the greatest attention.

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Selenia Spazio Researcher on New Satellite Communications

5500m292 Milan ALTA FREQUENZA in English No 10, Dec 87 pp 415-420

[Article by Claudio Mastracci of Selenia Spazio S.p.A.: "Satellite Communication Technology on Board and on Ground Systems: An Overview of Point to Point Systems Perspective"]

[Excerpts]

1. Introduction

The entire telecommunications world is rapidly evolving under the continuous pressure of both increasing social demand and technological progress: new "value added" services are offered to potential customers at progressively decreasing prices.

In Italy, like in most industrialized countries, an evolution of the terrestrial network toward the new Integrated Service Digital Network (ISDN) concept is currently in progress and new wideband and data services will be made available to users as soon as they can be incorporated into the system. It is likely that a continuous progression through a series of intermediate network configurations will occur during such evolution rather than the implementation of a sequence of predefined network configurations.

It is difficult therefore, at least in Italy, to envisage the time needed before new networks are implemented.

The operational role of an Italian domestic satellite should be assessed both taking into account the rather unpredictable situation which will be encountered in the near future on the terrestrial network and the possibility that the satellite itself could, to some extent, influence the evolutionary process. At least during the probable long intermediate phases of evolution, a "complementary" role rather than a "competitive" role may be envisaged for a point to point domestic satellite which could provide some of the "value added" services which shall be currently offered by ISDN in the future.

Switched digital telephony data services, videoconference through satellite, high speed facsimile, etc. can therefore be made available nationwide to users even before the ISDN network is completely implemented, however full ISDN-satellite compatibility should be guaranteed at terminal equipment level.

3. Technological Evolution

The increasing demand for new telecommunications services and the progressive competiveness of terrestrial systems have pushed satellite designers to invest more in R&D activities. These investments are both in the field of the design techniques and in that of the space technologies, in order to obtain systems which could be economically and technically competitive. This evolutionary process of space communications can be synthesized into three phases depicted in the following:

Figure 1. TLC [Telecommunications] Satellite Systems Design Evolution

I phase—Space Experimentation

- Low complexity on board
- High complexity on ground
- Basic technology development
- Relatively high costs

II phase—Space Industrialization

- Design/manufacturing process improvement
- Proven technology
- Satellite configuration for large reuse and minimum launch cost

III phase—Space Commercialization

- Higher complexity on board
- New technology development
- Minimum complexity on ground
- Minimum system costs

Some aspects of such innovation processes are described below. In order to assure and maintain competitivity, for those communication satellite systems conceived to complement regional and domestic terrestrial networks, these are considered by the space industry to be particularly significant.

1. Medium size satellites for regional and domestic telecommunications applications appear to be more cost effective since they could benefit of the multiple-launching capabilities of the new launchers, thus sharing with other users the severely increasing costs related to the launch (Figure 2).

Figure 2. TLC Satellites Size

Mission	Medium size Italsat	Large size Olympus
Application	Domestic Telephone/data Propagation	Regional Multimission TVBS/data Propagation
S/C at launch		
Diameter (m)	2.7	2.9
Height (m)	3.5	5.2
Weight (kg)	1680	2530
DC power required (W)	1700	3220
P/L freq. bands	Ku	Ka/Ku
Weight (kg)	240	350
DC power (W)	1000	2350
N. transponders	9 plus propag. package	8 plus propag. package
Total BW (MHz)	830	226
Launcher	Half-Ariane 4	Full Ariane 4

The realization of such systems in medium-size medium weight satellites is made possible by the appropriate use of lightweight structures, circuit integration techniques and innovative power generation systems which show continuously improving merit factors.

Moreover large satellites seem to be required for heavy multimission applications and mostly direct TV broadcasting.

The difficulty in forecasting requirements for intercontinental links is driving planners to consider medium size satellites to move in orbit in support via intersatellite link to the large existing satellites.

2. The introduction of the "modular approach" in the spacecraft design makes available modular elements (Figure 3) which may be used for more than one project and which will make possible extensive reuse of production techniques and ground support equipments; only the Telecommunications payload may be designed on a case by case basis to fit the specific scope of the mission.

The "modular approach" becomes a requirement if schedule constraints are considered: a period of 2-3 years is considered to be the average acceptable time between the system specification and the readiness for launching in case of commercial application. This will be possible only if relevant investment are made by Industries both in organizational resources able to manage large recurring programs and in the development of suitable modular systems which could be easily adapted or converted to the specific mission.

3. The "system complexity," formerly concentrated in the ground segment, is progressively migrating toward the space segment. This will on the one hand simplify and reduce the cost of the ground terminals and, on the other hand will increase the operational flexibility of the Telecommunications system. Both aspects are of primary importance particularly for domestic and regional systems.

Thus Space-qualified integrated digital processors and computers systems will play an important role both in managing more complex Telecommunications functions and in optimizing the operational system life (Figure 4).

The availability of new computer-aided techniques and the evolution of semicustom integrated circuits will allow the design and realization of new, custom-designed integrated circuits (ASICs - Application Specific Integrated Circuits) in shorter time and at less overall system cost (Figure 5 [not shown]).

4. On board antenna systems will become more sophisticated and will, basically, evolve toward multibeam which allow frequency reuse, coverage shaping to minimize ground stations cost and size, and beam reconfigurability to serve different areas with the same antenna system. (Figure 6 [not shown] shows a beam-forming network section for a 12 GHz multibeam antenna).

The use of frequency-selective and polarization-selective surfaces (dichroic and gridded surfaces) will greatly help in the design of the new high gain antenna systems by taking advantage of the double use of the reflectors in the generally limited areas available on board the satellites.

5. New frontiers are opened by the extensive use of MMICs (Microwave Monolithic Integrated Circuits) in the electronic equipment. (Figure 7 [not shown] shows a 2 inch GaAs wafer with about 1600 GHz local oscillators, 1.2 mm each, before cutting).

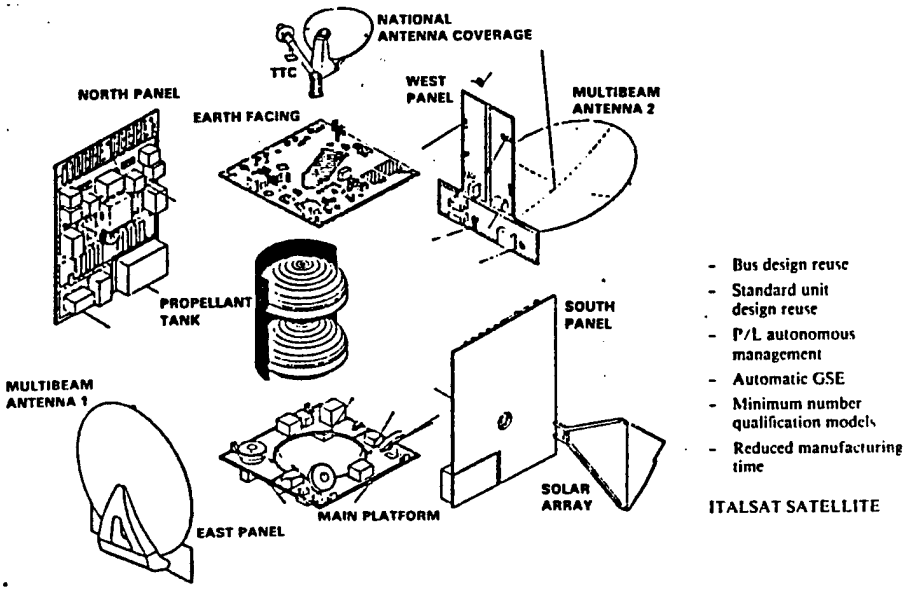


Figure 3. Satellite System Design Modular Concept

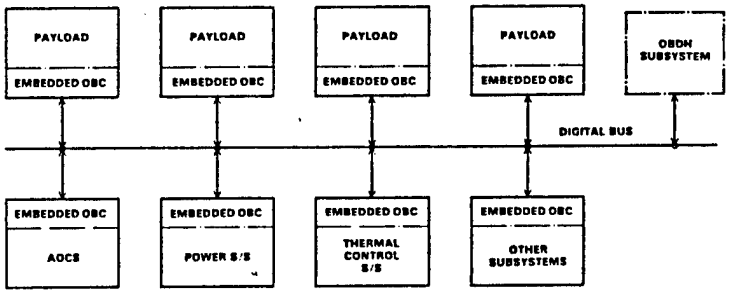


Figure 4. Distributed Computers Embedded in Each Payload and Subsystem

New antenna configurations, such as active arrays, now up to Ku band, where the beam forming networks incorporate final RF power amplification elements and low noise receiving amplifiers (previously located in the transponders area) will allow drastic volume and weight reduction with increasing overall system efficiency.

6. Saturation in the present frequency bands is pushing the solution of new technology problems. Dual polarization and high directivity antennas are extensively used in order to reuse same frequencies in contiguous areas.

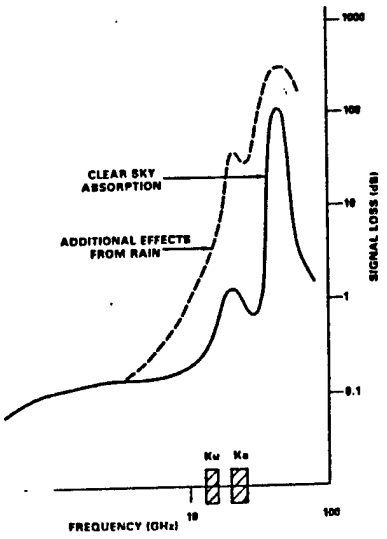
Higher frequency bands (20-30 GHz) are being explored and utilized. At these frequencies there are larger capacities available for use but, on the other hand, the effects of the atmospheric attenuation on the transmitted signals are more severe. Thus new sophisticated systems to control the radiated power will be required to overcome these effects both at the ground terminals and on-board (Figure 8).

7. New "regenerative" satellite transponders (Figure 9) are used which improve transmission efficiency and link performance by means of on-board demodulation and subsequent re-modulation of the signals. This improves system performance without affecting the complexity and the costs of the ground terminals.

The incorporation of "regeneration" and "switching" features within the same payload allows baseband interconnection of more satellite transponders through an appropriate "matrix." This technique which is being implemented on the ITAL-SAT system, will allow the dynamic management of the transmission resources by means of "routing plans" stored in the on-board payload and updated by appropriate commands transmitted by the system control ground station.

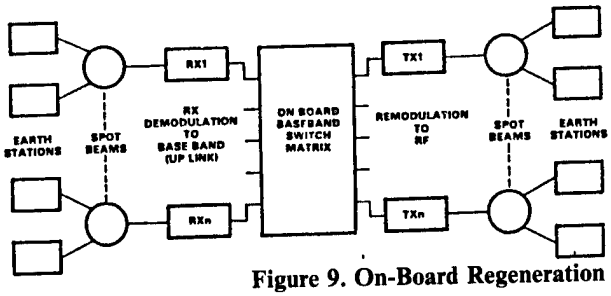
FDMA techniques in the up link associated with TDM techniques in the down link allow the most efficient RF power management either at the ground station and at the on-board transponders.

With on board regeneration, transmultiplexing and coding features FDMA/TDM systems appear to offer extremely interesting solutions for future business systems involving very small and low cost antenna terminals (two meters diameter) located at the users premises (Figure 10).



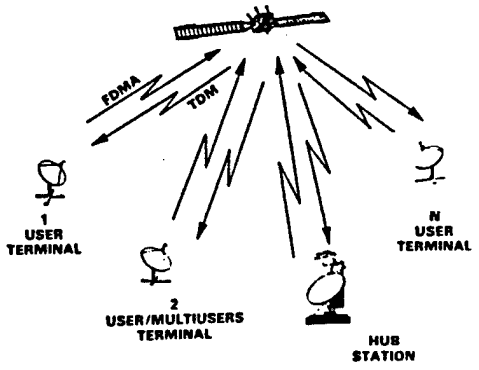
- Higher frequencies (20-30 GHz) allow:
  - to avoid saturation of present bands allocated
  - to increase band capacity
- Higher sensitivity effects from rain attenuation is reduced by fade sensors through fade beacons which allow:
  - to control on ground on board output RF power (15/5 dB)
  - to change burst rate with forwar error correction coding (FEC) (10 dB)

Figure 8. New Frequency Banks for Space Communications



- On board signal regeneration improves overall link
- Signal processing and storage is allowed
- Baseband switching matrix dynamically controlled redistributes traffic

Figure 9. On-Board Regeneration and Processing



Up link up to 2 Mbit/s
Down link N × 2Mbit/s

On board:

- Multicarrier demodulation
- Regeneration
- Digital processing
- Multiplexing
- Remodulation

On ground:

- Few tenths RF power
- Two meter dia ant. about

- Minimum EIRP and low bit rate continuous wave modems allow to reduce ground stations complexity and cost
- Saturated power amplifiers optimize on board DC power utilization
- On board regeneration and signal coding provide good system margins with reduced RF power

Figure 10. FDMA/TDM VSAT Business System

4. Conclusions

Key points such as: visibility, service anticipation capability and operation flexibility give satellite systems new outstanding role in fixed points links where terrestrial network services and technology are very fast evolving.

This new satellite role is supported by advanced space design techniques which allow on board operation and processing increasing with ground stations complexity and cost reduction.

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NORWAY

Three of Largest Businesses in Mobile Phone Project

55002451 Oslo AFTENPOSTEN in Norwegian 9 Apr 88 p 10

[Article by Ulf Peter Hellstrom: "Mobile Phone Investments Total 100 Million Kroner"]

[Text] Three key Norwegian institutions will now invest 100 million kroner in participating in the development of the future mobile telephone system in Europe. The Simonsen Elektro firm, which is listed on the stock exchange, the telecommunications division of the enormous EB concern and the ELAB research institute at Norway's Technical College are joining forces to compete for a market that will probably be worth close to 100 billion kroner by the year 2000.

"This is an enormous boost for us. If we succeed we can depend on the financial support being there when we need it," said administrative director Roald Aarset of Simonsen Elektro, which will be central in the further development of the Norwegian project.

"The EB concern already earns over a billion kroner from exports and we view this as a potential source of future income on the export side," said director Christian Brinch of EB's Telecom division.

The three Norwegian institutions—whose efforts have been encouraged by the Norwegian Telecommunications Administration—are now setting their sights on one of the strongest potential growth markets in Europe for the rest of the century. Developments in Norway show that there is great interest—and a lot of money—in a mobile phone network that functions to some extent. The expansion of mobile phones in Norway has exceeded all official predictions. Now a new mobile telephone system is scheduled for development in Europe. Norwegian advanced technology is banking on coming in early enough to skim off some of the cream.

The two companies, Simonsen Elektro and EB, and the ELAB research institute have entered into a cooperative agreement on the development and future regular mass production of components for the future European mobile phone system, GMS, which by all reports will lead the way in the wealthy EC area. This network will be entirely digital and will be capable of transmitting data and other forms of information as well as conversations.

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